# LS-3
# SOLVENT RECOVERY PRESENTATION

# 10.01.2025

# Solvents usage Reduction (OCT-DEC-2024)

| S No | Product | Stage Code | Solvent name | Existing Qty | Reduced Qty | Saving in Lts | Usage % of Reduction | Remarks |
|---|---|---|---|---|---|---|---|---|
| 1 | **Clopidogrel** | COPB1 | MDC | 3500 | 2700 | 800 | 22.86 | |
| | | CTPS1 | Toluene | 1800 | 1400 | 400 | 22.22 | |
| | | CGBH1 | MDC | 2000 | 1600 | 400 | 20 | |
| | | | Toluene | 2600 | 2100 | 500 | 19.23 | |
| | | | Methanol | 80 | 40 | 40 | 50 | |
| | | CGBH2 | Cyclohexane | 2500 | 2000 | 500 | 20 | |
| 2 | **Flicanideacetate** | FNDA1 | Toluene | 1625 | 625 | 1000 | 61.54 | |
| | | | n-Heptane | 5200 | 2600 | 2600 | 50 | |
| 3 | **Oseltamivir** | OSM | Triethylamine | 790 | 330 | 460 | 58.23 | |
| | | | Ethanol | 1200 | 200 | 1000 | 83.33 | Ethanol recovery contains Ethanol 91% & Ketone 8-9%. |
| 4 | **Raw material(M-274)** | | Diethylketone | 402 | 301 | 101 | 25.12 | |
| 5 | **Pregabalin** | PBLN3 | Methanol | 3000 | 2200 | 800 | 26.67 | ANFD washings removal experiments going on |
| 6 | **Atorvastatin** | ATSC2 | IPA | 4500 | 3600 | 900 | 20 | |
| | | | | **29197** | **19696** | **9501** | **33** | |

# Recovery Solvents usages details

| S No | Product | Stage code | Solvent | Fresh Used per batch | Recovery used per batch | Total solvent used | Present Usage % | Target of usage % | Remarks |
|---|---|---|---|---|---|---|---|---|---|
| 1 | **Atorvastatin** | ATSC1 | Cyclohexane | 1800 | 4200 | 6000 | 70 | 75 | **Nutch filter /workup/Plant Distillation** |
| | | | IPA | 3200 | 3200 | 6400 | 50 | 55 | **Water media /CF/Plant /Column distillation** |
| | | ATSC2 | Acetonitrile | 1750 | 1750 | 3500 | 50 | 53 | **CF/Plant /Column distillation** |
| | | | IPA | 1750 | 1750 | 3500 | 50 | 55 | **CF/Plant /Column distillation** |
| 2 | **Gadobutrol** | GDBL2 | Toluene | 6300 | 0 | 6300 | 87.3 | 90 | **Using in Pregabalin / Clopidogrel** |
| | | | MTBE | 7350 | 0 | 7350 | 61.22 | 65 | **Workup/Plant disti & Given to SRS** |
| | | | MDC | 2280 | 0 | 2280 | 74.56 | 76 | **Using in Clopidogrel** |
| | | GDBL3 | Ethanol | 4560 | 0 | 4560 | 87.72 | 87.72 | **CF/Plant distillation &Given to SRS / Not used MC concern** |
| | | | Methanol | 4560 | 0 | 4560 | 87.72 | 87.72 | **CF/Plant /Column &using in Pregabalin** |
| 3 | **Pregabalin** | AMHA1 | Toluene | 400 | 4000 | 4400 | 90.91 | 90.91 | **Workup / Plant distillation** |
| | | | Methanol | 1800 | 1500 | 3300 | 45.45 | 50 | **Reaction consumption 600 lts / Plant / Column** |
| | | AMHA2 | Toluene | 400 | 7000 | 7400 | 94.59 | 95 | **Workup / Plant distillation** |
| | | | Ammonia | 2400 | 7400 | 9800 | 75.51 | 75.51 | **Work up/Plant distillation** |
| | | | Ethylacetate | 400 | 1400 | 1800 | 77.78 | 80 | **workup / CF/Plant distillation** |
| | | AMHA3 | Toluene | 100 | 700 | 800 | 87.5 | 90 | **workup /Plant distillation** |
| | | | Methanol | 3000 | 2700 | 5700 | 50 | 55 | **Water media/ANFD/Plant distillation** |

# Recovery Solvents usages details

| S No | Product | Stage code | Solvent | Fresh Used per batch | Recovery used per batch | Total solvent used | Present Usage % | Target of usage % | Remarks |
|---|---|---|---|---|---|---|---|---|---|
| 4 | **Clopidogril** | COPB1 | MDC | 800 | 2700 | 3500 | 77 | 80 | **Workup/Plant distillation** |
| | | | Methanol | 4100 | 4100 | 8200 | 50 | 60 | **Methanol+Acetone Mixedsolvent** |
| | | | Acetone | 350 | 730 | 1080 | 67.59 | 67.59 | |
| | | CTPS1 | Toluene | 200 | 1600 | 1800 | 88.89 | 90 | **Workup/plant distillation** |
| | | | Cyclohexane | 400 | 1800 | 2200 | 81.82 | 85 | **ANFD / Plant distillation** |
| | | CGBS1 | MDC | 800 | 1200 | 2000 | 60 | 65 | **Workup/Plant distillation** |
| | | | IPA | 1200 | 1650 | 2850 | 57.89 | 60 | **Water media/CF/Plant distil / Column distillation** |
| | | | Toluene | 800 | 3850 | 4650 | 82.8 | 85 | **Water media/CF/Plant distil / Column distillation** |
| | | CGBS2 | Ethylacetate | 1400 | 2100 | 3500 | 60 | 65 | **workup / CF/Plant distillation** |
| | | | Cyclohexane | 700 | 1800 | 2500 | 72 | 75 | **work up / plant** |
| | | | Acetone | 1550 | 1550 | 3100 | 50 | 55 | **workup / CF/Plant distil / Column distillation** |
| 5 | **Rosuvastatin** | RSC2B | IPA | 1200 | 900 | 2100 | 42.86 | 45 | **Water media /Plant / Column distillation** |
| | | | Ethylacetate | 4300 | 8300 | 12600 | 65.87 | 70 | **CF/Plant / Column distillation** |
| 6 | **Flicanideacetate** | FNDA1 | Toluene | 825 | 800 | 1625 | 49.23 | 50 | **Mixed solvent /Work up / plant distil / Column distillation** |
| | | | n-heptane | 2600 | 2600 | 5200 | 50 | 55 | |

# Solvents purchase trend

| Quantity in MT | Apr'24 | May'24 | Jun'24 | Jul'24 | Aug'24 | Sep'24 | Oct'24 | Nov'24 | Dec'24 | Total | Average/ month |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Fresh solvents | 535 | 859 | 681 | 775 | 803 | 1017 | 748 | 620 | 500 | 6538 | 726 |
| RFS Solvents from Job work | | | | | 20 | | | | | | 2 |
| RFS Solvents from IH Column & PD | 803 | 660 | 702 | 747 | 751 | 605 | 756 | 615 | 505 | 5639 | 705 |
| Total | 1338 | 1519 | 1384 | 1521 | 1575 | 1622 | 1504 | 1325 | 1005 | 11788 | 1473 |

| Value in Crs | Apr'24 | May'24 | Jun'24 | Jul'24 | Aug'24 | Sep'24 | Oct'24 | Nov'24 | Dec'24 | Total | Average/ month |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Fresh solvents | 3.6 | 5.5 | 5.8 | 5.2 | 5.2 | 6.3 | 4.2 | 3.7 | 3.0 | 42.5 | 4.7 |
| RFS Solvents from Job work | | | | | 0.2 | | | | | 0.2 | 0 |
| RFS Solvents from IH Column & PD | 1.61 | 1.32 | 1.4 | 1.49 | 1.5 | 1.21 | 1.51 | 1.41 | 1.01 | 11.45 | 1.4 |
| Total | 5.2 | 6.8 | 7.2 | 6.7 | 6.9 | 7.5 | 5.7 | 5.1 | 4.01 | 51.1 | 6.4 |

# LS-3 COLUMN OUTPUT DATA

| LS-3 SRS COLUMN RECOVERY FROM JAN-DEC-24 | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| UNIT | Jan-24 | Feb-24 | Mar-24 | Apr-24 | May-24 | Jun-24 | Jul-24 | Aug-24 | Sep-24 | Oct-24 | Nov-24 | Dec-24 | Total Qty. (KL) | 2025 Target (KL) |
| LS-2 Output | 155.7 | 191.9 | 132.5 | 192.4 | 121 | 128.1 | 258.4 | 179.97 | 69.5 | 243.1 | 253.2 | 214.5 | 2140.27 | 3500 |
| Other Units Output | 0 | 0 | 0 | 0 | 0 | 0 | 16.5 | 8.3 | 67.3 | 55 | 88.4 | 86.2 | 321.7 | 1000 |
| LS-3 Output | 527.3 | 518.2 | 668.8 | 610.9 | 539 | 574.3 | 471.6 | 563.13 | 468.3 | 451.91 | 265 | 203.7 | 5862.14 | 10000 |
| TOTAL OUTPUT | 707.7 | 710.1 | 801.3 | 803.3 | 660 | 702.4 | 746.5 | 751.4 | 605.1 | 750 | 606.5 | 504.4 | 8348.7 | 14500 |

# LS-3 SRS Solvent Recovery %

| 2023-2024 Column Recovery (%) | | | | 2024-2025 Column Recovery (%) (Target) | | |
|---|---|---|---|---|---|---|
| Solvent Name | Stage | From | To | Solvent Name | Stage | % Yield (Target) |
| Methanol | AMHA1 | 61.8 | 64.01 | Methanol | AMHA1 | 68 |
| Acetone | CGBH2 | 71.68 | 74.83 | Acetone | CGBH2 | 78 |
| Acetone | VGPT2 | 74 | -- | Acetone | VGPT2 | 76 |
| Acetone | DGT1 | 68.23 | 73.78 | Acetone | DGT1 | 78 |
| Ethyl Acetate | RSC2B | 73.58 | 80 | Ethyl Acetate | RSC2B | 90 |
| Ethyl Acetate | LDC1 | -- | 87 | Ethyl Acetate | LDC1 | 90 |
| Ethyl Acetate | DGT1 | -- | 76 | Ethyl Acetate | DGT1 | 80 |
| Acetonitrile | ATSC2 | 59.68 | 64.44 | Acetonitrile | ATSC2 | 68 |
| Cyclohexane | CTPS | 83 | -- | Cyclohexane | CTPS | 86 |
| IPA | ATSC1 | 62.5 | 64.66 | IPA | ATSC1 | 68 |
| IPA | ATSC2 | 66 | 69.42 | IPA | ATSC2 | 73 |
| IPA | CGBH1 | 65 | 68.43 | IPA | CGBH1 | 71 |
| IPA | VIGB2 | 73 | 76.58 | IPA | VIGB2 | 79 |
| IPA | RSC2B | 54 | 63 | IPA | RSC2B | 65 |
| IPA | STPM3 | 71 | -- | IPA | STPM3 | 75 |
| IPA | VGPT2 | 56.52 | 58 | IPA | VGPT2 | 60 |
| IPA | OSM | -- | 51 | IPA | OSM | 55 |
| IPA | PBLN | -- | 68.43 | IPA | PBLN | 71 |
| MDC | OSM3 | 75.6 | 78.4 | MDC | OSM3 | 85 |
| MDC | VGPT2 | 84 | 85.19 | MDC | VGPT2 | 88 |
| MDC | DGT1 | 88 | 90.11 | MDC | DGT1 | 95 |
| MDC | DEM3 | -- | 84 | MDC | DEM3 | 88 |
| Toluene | CGBH1 | -- | 75.6 | Toluene | CGBH1 | 78 |
| Toluene | LDC1 | -- | 82 | Toluene | LDC1 | 85 |
| Average (%) | | 69.85 | 73.08 | Average (%) | | 77.08 |

# Key points for discussion

| S. No | Key point | Actions |
|---|---|---|
| 1 | Recovered Solvent Usage | • Rosuvastatin IPA Recovery usage established in this year with 96.5% purity and taking concurance from LS3.<br>• Used 267 KL in batches , as per earlier IPA not used , earlier sold out as mixed spent. 2.67 cros cost saved.<br>• Rosuvastatin Ethylacetate column distilled fractions selling outside , by taking initiation 60% recovery taken from selling fractions, taking concurance from LS3.<br>• Current usage is 65%, we will have increased by 10%. (Rosuvastatin Calcium, Atrovastatin Calcium, Clopidogrel bisuphate, Pregabalin, FNDA) used in Intermediate stages.<br>• Rosuvastatin Ethyl Acetate Fraction quantities completely recovered, Pregabalin Methnaol+Toluene fractions recycled, Toluene and Methanol recovery % increased. Atrovastatin IPA Fraction-1 accumulated solvent Column distilled.<br>•Famotidine, Meditomodine, Atogepant, Vonoprazan & Doxpin – We will try to use recovery solvents(glass Column trials completed), it is under process in R&D. |

# Key points for discussion

| S. No | Key point | Actions |
|---|---|---|
| 1 | Spent solvent sale & solvent losses reduction | Spent solvent sale to be reduction by 3% (Current sale is 10%) & Solvent losses reduction by 4% (Current loss is 22%) |
| 2 | Internal units Mixture of Solvents Recovery | ➢ LS-3 total Solvents In-house Recovery only (We didn't send to any job work from our end)<br>➢ We recovered Internal Units spent solvent in Column Distillation<br>➢ **LS-2:** Solvents MDC, IPA, Acetone, MTBE, Toluene, Methanol, Acetonitrile+Water Column Distilled in LS-3. Triple mixture solvent<br>➢ Cyclohexane+Toluene+MTBE+Unknown previously considered as mixed solvent and sent for sale purpose,<br>➢ **Pharma Chem:** Solvents Acetone+Ethanol, Methanol+Acetonitrile+TEA<br>➢ **MLPL-2:**Solvents MTBE+Toluene<br>➢ **MSN Organics:** Solvents Methanol+Toluene+Water, Acetone+Water, IPA+Methanol+CHN+EA+Toluene,Acetonitrile+Ethyl Acetate,Methnaol+Tolune+Acetone<br>➢ **LS-4:** n-Heptane solvents received for Column Distillation.<br>➢ **Enal drugs-2:** IPA+Water<br>➢ **Enal drugs-1:** Methanol, Acetone |

# THANK YOU